CLAIMS

We claim:

1. A system for removing organic or organometallic materials from an article comprising:

an enclosed vacuum reaction chamber constructed and arranged to contain an article having organic or organometallic materials located therein;

said enclosed vacuum reaction chamber containing an oxygen-containing gas, wherein the vacuum pressure within said enclosed vacuum reaction chamber is between about 50 mtorr and about 1500 mtorr;

means for emitting vacuum ultraviolet rays having a wavelength of about 172 nm contained within said enclosed vacuum reaction chamber;

wherein said emitted vacuum ultraviolet rays fragment the hydrocarbon bonds in said organic or organometallic materials;

wherein said oxygen-containing gas within said enclosed vacuum reaction chamber and said emitted vacuum ultraviolet rays photochemically react to produce ozone and activated oxygen; and

wherein said ozone and said activated oxygen react with said fragments of said organic and organometallic materials.

2. The system as defined in Claim 1, wherein said means for emitting vacuum ultraviolet rays is one or more dielectric barrier discharge lamps.

3. The system as defined in Claim 2, wherein said one or more dielectric barrier discharge lamps contain xenon gas in an excimer state.

4. A system for removing organic and organometallic materials from an article comprising:

a vacuum reaction chamber in which the vacuum pressure is from about 50 mtorr to 1500 mtorr, said vacuum reaction chamber containing oxygen-containing gas and at least one article having organic or organometallic materials located thereon;

means for emitting vacuum ultraviolet rays having a wavelength of about 172 nm contained within said vacuum reaction chamber;

whereby when said vacuum ultraviolet rays are emitted within said vacuum reaction chamber the hydrogen bonds in said organic or organometallic materials are fragmented and oxygen-containing gas is broken down to produce ozone and activated oxygen; and

said ozone and said activated oxygen combine with said fragmented portions of said organic and organometallic materials.

5. The system as defined in Claim 4, wherein said means for emitting vacuum ultraviolet rays is one or more dielectric barrier discharge lamps.

6. The system as defined in Claim 5, wherein said one or more dielectric barrier discharge lamps contain xenon gas in an excimer state.

7. A method for removing organic or organometallic materials from an article, said method comprising the steps of:

creating a vacuum of about 50 mtorr to about 1500 mtorr in an oxygen-containing gas in a chamber;

placing an article containing organic or organometallic materials in said oxygen-containing gas within said chamber;

irradiating said organic or organometallic materials with vacuum ultraviolet rays having a wavelength of about 172 nm to induce an intermolecular molecule energy transfer to said organic or organometallic material, whereby said intermolecular molecule energy transfer results in a cleaving of at least one of the hydrogen bonds within said organic or organometallic material;

irradiating said oxygen-containing gas to create ozone and activated oxygen; and

allowing said ozone and said activated oxygen to combine with said cleaved portions of said organic or organometallic material.

8. The method as defined in Claim 7, wherein said ozone and said activated oxygen are produced by a photochemical reaction.

9. The method as defined in Claim 7, wherein one or more dielectric barrier discharge lamps are used to produce said vacuum ultraviolet rays.

10. The method as defined in Claim 9, wherein said one or more dielectric barrier discharge lamps encapsulate xenon gas in an excimer state.

11. An article from which organic or organometallic materials have been removed, said article being produced by a process including the steps of:

a) creating a vacuum of about 50 mtorr to about 1500 mtorr in a chamber containing an oxygen-containing gas;

b) placing an article including the organic or organometallic materials in said chamber;

c) irradiating said organic or organometallic materials and said oxygen-containing gas within said chamber with vacuum ultraviolet light rays having a wavelength of about 172 nm; and

d) removing said organic or organometallic materials from said article utilizing the ozone and activated oxygen produced in step c).

12. The article as defined in Claim 11, wherein said ozone and said activated oxygen are produced by a photochemical reaction.

13. The article as defined in Claim 11 wherein said step for irradiating said oxygen-containing gas utilizes at least one dielectric barrier discharge lamp.

14. The article as defined in Claim 13 wherein said one or more dielectric barrier discharge lamps contain xenon gas in an excimer state.

15. A system for removing the organic or organometallic material from an article in a dry environment, said system comprising:

an enclosed vacuum reaction chamber constructed and arranged to contain an article having organic or organometallic material on its surface and on its sidewalls;

said enclosed vacuum reaction chamber containing an oxygen-containing gas wherein the vacuum pressure is between about 50 mtorr and about 1500 mtorr;

an irradiation device for emitting vacuum ultraviolet rays having a wavelength of about 172 nm contained within said enclosed vacuum reaction chamber to induce an intermolecular molecule energy transfer to said organic or organometallic material and to create ozone and activated oxygen from said oxygen-containing gas; and

wherein said ozone and said activated oxygen removes said organic or organometallic material from said surface and said sidewalls of said article.

16. The system as defined in Claim 15 wherein said irradiation device is one or more dielectric barrier discharge lamps;

17. The system as defined in Claim 16 wherein said one or more dielectric barrier discharge lamps contains xenon gas in an excimer state.

18. A method for removing the sidewall polymer and photoresist from an article, said method comprising the steps of:

creating a vacuum of about 50 mtorr to about 1500 mtorr in a vacuum reaction chamber;

placing an article having sidewall polymer and photoresist in said vacuum reaction chamber;

irradiating said vacuum reaction chamber with vacuum ultraviolet light rays having a wavelength of about 172 nm to produce ozone and activated oxygen for removing said polymer and photoresist from said article.

19. The method as defined in Claim 18 wherein step for irradiating said vacuum reaction chamber is performed by at least one dielectric barrier discharge lamp.

20. The method as defined in Claim 19 wherein said dielectric barrier discharge lamp includes a xenon gas in an excimer state.

21. An apparatus for dissociating molecular bonds in a vacuum comprising:

a dielectric barrier discharge lamp capable of withstanding pressures between about 50 mtorr and 1500 mtorr.

22. An apparatus according to Claim 21 wherein said dielectric barrier discharge lamp includes a xenon gas in an excimer state.

23. An apparatus according to Claim 21 wherein said dielectric barrier discharge lamp emits wavelengths at approximately 172 nm.